

Application No.: 10/666,098

Case No.: 58961US002

REMARKS

Claims 1 to 76 are pending. Claims 27-70, 72, 73, and 76 have been withdrawn from consideration. Claim 9 is amended.

Claim 9 has been amended as suggested by the Examiner.

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Interview Summary

The undersigned acknowledges with appreciation the telephonic interview granted by the Examiner on May 9, 2006, and attended by the undersigned and Anatoly Rosenflanz (one of the named inventors), wherein the essence of the instant paper was discussed.

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Claim Indicators

The Office Action reminded Applicants to use the proper claim indicators.

It is believed the instant paper uses the proper claim identifiers.

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Information Disclosure Statements

It is said in the Office Action that:

The previously cited information disclosure statements have been considered. Conelly 3,560,780 (drawn to a vacuum tube), Woods (4,014,122) (drawn to a paperweight) and WO 03/001776 (drawn to a non-glass film) have been crossed off the IDS filed 2-13-06 because they are not considered to be relevant to the claimed invention.

Applicants' note that they did not cite U.S. Pat. No. 3,560,780, but did cite U.S. Pat. No. 3,650,780 (Connelly) on one of the PTO-1449 forms (copy enclosed) included with the Supplemental Information Disclosure Statement dated February 9, 2006. It is respectfully requested that the Examiner consider U.S. Pat. No. 3,650,780 (Connelly), and initial and return the enclosed PTO-1449 form citing such reference.

Applicants' note that with regard to "WO 03/001776", the correct number should have been WO 03/0011776. However, Applicant's note that the Examiner has already considered a related document application having U.S. Serial No. 10/211,481, filed August 2, 2002.

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§ 102 Rejections

Claims 1-14, 18-21, 23-26, 71, 74, 75 stand rejected under 35 USC §102(b) as being anticipated by U.S. Pat. No. 3,754,978 (Elmer et al.).

'978 (Elmer et al.) reports a devitrification-resistant glaze for high-silica glasses, particularly effective in inhibiting surface devitrification induced by contact with food-ash at elevated temperatures, formed from a coating consisting essentially, in weight percent, of about 25-85 percent Al_2O_3 and 15-75 percent ZrO_2 , and optionally containing up to about 10 percent Ta_2O_5 . The coating is preferably applied in the form of aqueous slurry which is dried and fired to produce a vitreous glaze.

Applicants, in independent claim 1, claim a glass collectively comprising at least 70 percent by weight of (i) at least one of Nb_2O_5 or Ta_2O_5 and (ii) at least two of (a) Al_2O_3 , (b) Y_2O_3 , or (c) at least one of ZrO_2 or HfO_2 , and containing not more than 30 percent by weight collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass.

It is said in the Office Action, in regard to Applicants' previous response, that Applicant's argument that the glaze taught by '978 (Elmer et al.) contains significantly more than 20 wt.% (understood to mean "30 wt.%") SiO_2 is not persuasive in overcoming the rejection. The Office Action alleges that the glaze (understood to be referring to the coating used to make the glaze) taught by '978 (Elmer et al.) does not contain SiO_2 (reference is made in the Office Action on this point to col. 2, lines 17-25). Further, it is said in the Office Action that there is no SiO_2 added to the glaze, the SiO_2 is the substrate the glaze is added to.

It is submitted the "glaze" referred to in '978 (Elmer et al.) formed from a coating having a composition about 25-85 by weight Al_2O_3 , 15-75 percent by weight ZrO_2 , and optionally up to 10 percent by weight Ta_2O_5 contains significantly more than 30 percent by weight SiO_2 , and hence does not anticipate independent claim 1 or independent claim 73. Claim 1 can contain no more than 30 percent by weight SiO_2 ; claim 73, no more than 3 percent.

The '978 (Elmer et al.) glaze that contains the Al_2O_3 , ZrO_2 , and optional Ta_2O_5 is made by reacting the Al_2O_3 , ZrO_2 , and optional Ta_2O_5 with high silica glass (see, e.g., col. 2, lines 5-10, 17-22, and 29-32; col. 3, lines 1-3; and col. 4, lines 4-6 and 10-17). The examples of "high silica" glasses listed in '978 (Elmer et al.) are fused silica (understood to be 100% silica) and a

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glass that is 96 percent by weight SiO_2 (see, e.g., col. 3, lines 1-3 and col. 4, lines 18-22). Applicants submit one of ordinary skill in the art understands that when the Al_2O_3 , ZrO_2 , and optional Ta_2O_5 are heated to form a melt, such as the case in the '978 (Elmer et al.), significant reaction with the SiO_2 (silica) will occur, and the resulting material (i.e., the glaze) will contain significantly more than 30 percent by weight SiO_2 . It is stated in the Office Action, however, that even if a reaction occurs, Applicants have not supplied any tangible evidence that the SiO_2 would be present throughout the glaze in amounts greater than 20 wt.% (understood to mean "30 wt.%"). Further, it is said in the Office Action that any reaction would be expected to be at the interface of the substrate and the glaze not the entire glaze and would lead to small amounts of silica. It is alleged in the Office Action that there is no tangible evidence that the amount of SiO_2 in the glaze is greater than 20 wt.% (understood to mean "30 wt.%"), particularly when the three components of the glaze form a glass. It is emphasized in the Office Action that the non-patent literature cited by Applicants in their previous response did not show the phase diagrams of a mixture of Al_2O_3 , ZrO_2 , and Ta_2O_5 combined.

The Office Action, however, fails to provide sufficient evidence to support a conclusion that the Al_2O_3 - ZrO_2 - Ta_2O_5 glazes in '978 (Elmer et al.) do not contain more than 30 wt.% SiO_2 , particularly in view of Applicants' evidence to the contrary. Moreover, '978 (Elmer et al.) at col. 4, lines 4-17 states:

Following drying, the coating is fired to a temperature sufficient to cause the fusion and interaction thereof with the glass substrate. We have found that this can conveniently be accomplished with the aid of a natural gas-oxygen flame without the need for heating the entire glass article to the temperature at which the coating will fuse to form a vitreous layer. Hence, sufficient heating to cause reaction of the coating with the glass-substrate to form a vitreous glaze can be accomplished by directing a gas-oxygen flame onto the area of the coating to be reacted for a period of several seconds, or until the coating has been converted to the vitreous state as a result of reacting with the high-silica glass substrate. (bolding added for emphasis)

Further, Example 1 of '978 (Elmer et al.) at col. 4, lines 4-17 states:

Following drying, the coating was reacted with the substrate by heating with a gas oxygen flame. The coating was completely transformed into vitreous layer by flame treating for a few seconds. After this, the treatment the coated and uncoated materials could not be distinguished by visual inspection. (bolding added for emphasis)

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Clearly, the resulting glaze contains SiO_2 . It is submitted that it is well known to one skilled in the art that these reactions referred to in '978 (Elmer et al.) will be the lowest melting point for the materials on the applicable phase diagram. While Applicants' evidence does not include a Al_2O_3 , ZrO_2 , and Ta_2O_5 phase diagram with or without SiO_2 , Applicants have provided phase diagrams for SiO_2 - Al_2O_3 - ZrO_2 and SiO_2 - Ta_2O_5 (FIGS. 772 and 4447, respectively; copies provided with the previous responses, and included with the instant paper), that clearly show the lowest melting points for each of these systems contain significantly more than 30 percent by weight SiO_2 . Glass resulting therefrom will also contain significantly more than 30 percent by weight SiO_2 .

Claims 2-14, 18-21, 23-26, 71, 74, and 75 depend directly or indirectly from claim 1. Claim 1 is patentable, for example, for the reasons given above. Therefore, claims 14, 18-21, 23-26, and 71, 74, and 75 should also be patentable.

The rejection of claims 1-14, 18-21, 23-26, 71, 74, and 75 under 35 USC §102 as being anticipated by Elmer et al (3,754,978) is unwarranted and should be withdrawn.

-U.S. Pat. No. 6,818,578 (Tachiwama)

Although it is alleged in the Office Action that U.S. Pat. No. 6,818,578 (Tachiwama) is prior art, and Examples 1 and 9, which are said to include 81.3 wt% and 81.1 wt% respectively, of a total rare earth oxide (including yttria), ZrO_2 , Nb_2O_5 and Al_2O_3 , fall within the scope of the instant claims, there is no formal statutory rejection set forth. It is understood from the interview this should be treated as a 35 USC §102 rejection.

Example 1 of '578 (Tachiwama) collectively includes 81.3 wt.% rare earth oxide (57.8%), ZrO_2 (5.2%), Nb_2O_5 (0.8%), Ta_2O_5 (14.9%) and Al_2O_3 (2.6%). Further, Example 9 collectively includes 81.1 wt.% rare earth oxide (La_2O_3 , Gd_2O_3 , Yb_2O_3 ; 54.2%), Y_2O_3 (5%), ZrO_2 (5.4%), Ta_2O_5 (15.9%), and Nb_2O_5 (0.6%). Applicants, however, disagree that yttria is a rare earth oxide. Nor do Applicants' agree that they are synonymous or interchangeable.

By contrast, Applicants', in claim 1, claim glass collectively comprising at least 70 percent by weight of (i) at least one of Nb_2O_5 or Ta_2O_5 and (ii) at least two of (a) Al_2O_3 , (b) Y_2O_3 , or (c) at least one of ZrO_2 or HfO_2 , and the glass containing not more than 30 percent by weight

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collectively As_2O_3 , B_2O_3 , GeO_2 , P_2O_5 , SiO_2 , TeO_2 , and V_2O_5 , based on the total weight of the glass. Example 1 of '578 (Tachiwama) falls far short of Applicants' "at least 70 percent" requirement as this example only collectively includes 23.5 wt.% ZrO_2 (5.2%), Nb_2O_5 (0.8%), Ta_2O_5 (14.9%) and Al_2O_3 (2.6%) (and 0% Y_2O_3). Example 9 of '578 (Tachiwama) also falls far short of Applicants' "at least 70 percent" requirement as this example only collectively includes 26.9 wt. % Y_2O_3 (5%), ZrO_2 (5.4%), Ta_2O_5 (15.9%), and Nb_2O_5 (0.6%).

Clearly, Examples 1 and 9 of '578 (Tachiwama) fail to teach or suggest claim 1.

Claims 2-14, 18-21, 23-26, 71, 74, and 75 depend directly or indirectly from claim 1. Claim 1 is patentable, for example, for the reasons given above. Therefore, claims 14, 18-21, 23-26, and 71, 74, and 75 should also be patentable.

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Double Patenting

Claims 1-26, 71, 74, and 75 are said to be provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 6-23, 69, 73 and 74 of copending Application No. 10/616,212. Although the conflicting claims are said not to be identical, they are not patentably distinct from each other because of reasons set forth.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

While not agreeing that the instant obviousness-type double patenting rejection is proper, even if the provisional status were removed, to facilitate prosecution, submitted herewith is a Terminal Disclaimer that obviates the rejection.

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In view of the above, it is submitted that the application is in condition for allowance.
Reconsideration of the application, amended, is requested.

Allowance of the pending claims at an early date is solicited.

Respectfully submitted,

Date June 5, 2006

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Phase Diagrams for Ceramists

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Compiled at the National Bureau of Standards

Margie K. Reser, *Editor*

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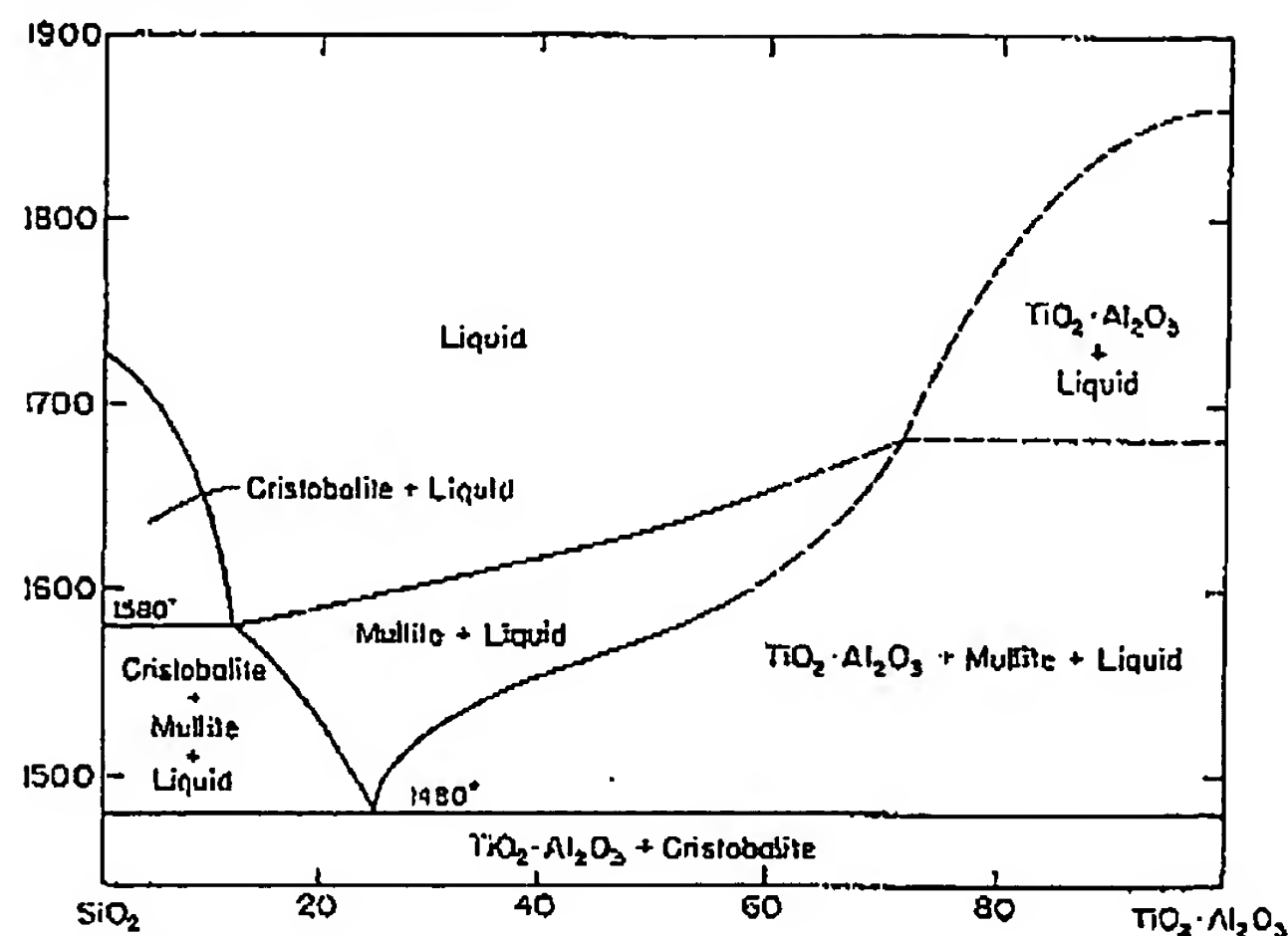
$\text{Al}_2\text{O}_3\text{-SiO}_2\text{-TiO}_2$ (concl.)

FIG. 771.—System $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-TiO}_2$.
Y. M. Agamawi and J. White, *Trans. Brit. Ceram. Soc.*, 51, 310 (1951-52).

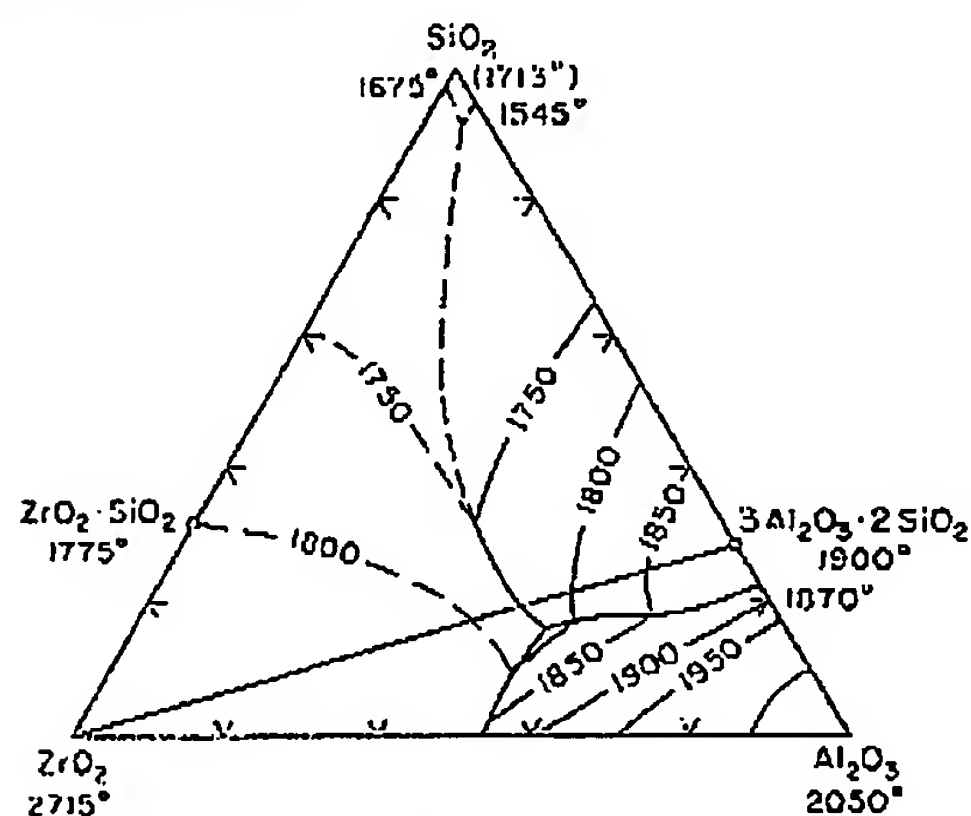
 $\text{Al}_2\text{O}_3\text{-SiO}_2\text{-ZrO}_2$ 

FIG. 772.—System $\text{Al}_2\text{O}_3\text{-SiO}_2\text{-ZrO}_2$.

P. P. Budnikov and A. A. Litvakovskii, *Doklady Akad. Nauk S.S.S.R.*, 106, 268 (1956).

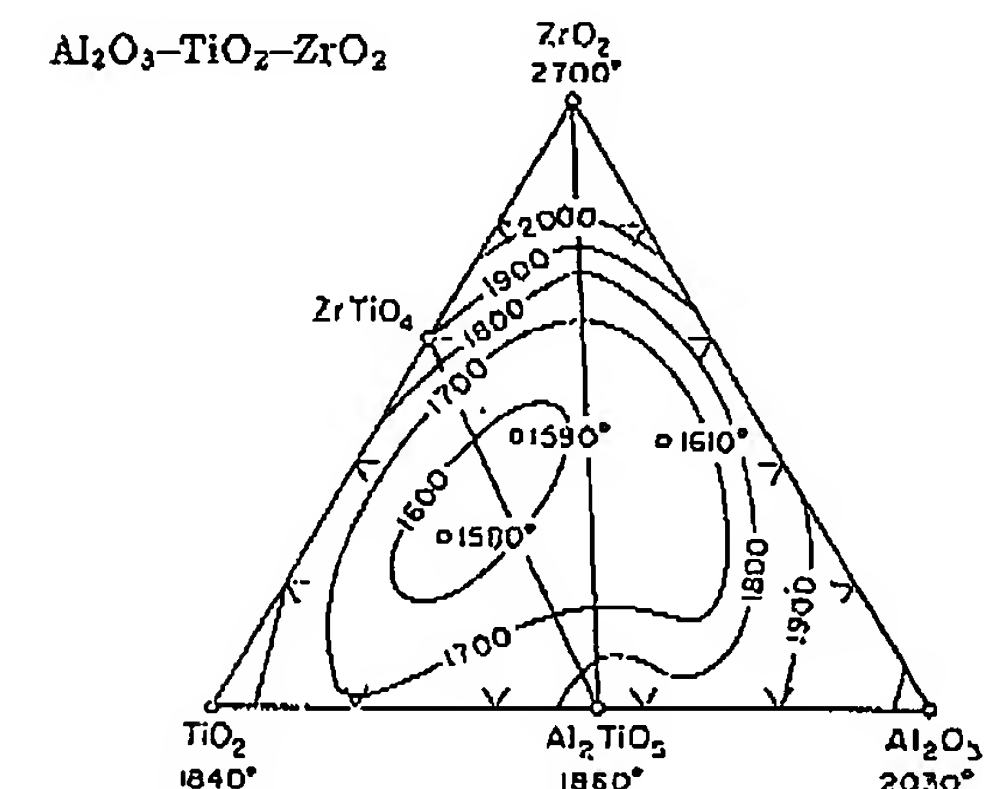
 $\text{Al}_2\text{O}_3\text{-TiO}_2\text{-ZrO}_2$ 

FIG. 773.—System $\text{Al}_2\text{O}_3\text{-TiO}_2\text{-ZrO}_2$; melting isotherms.

A. S. Berezhnoi and N. V. Gul'ko, *Dopovidi Akad. Nauk Ukr. R.S.R.*, 1955 [1] 78.

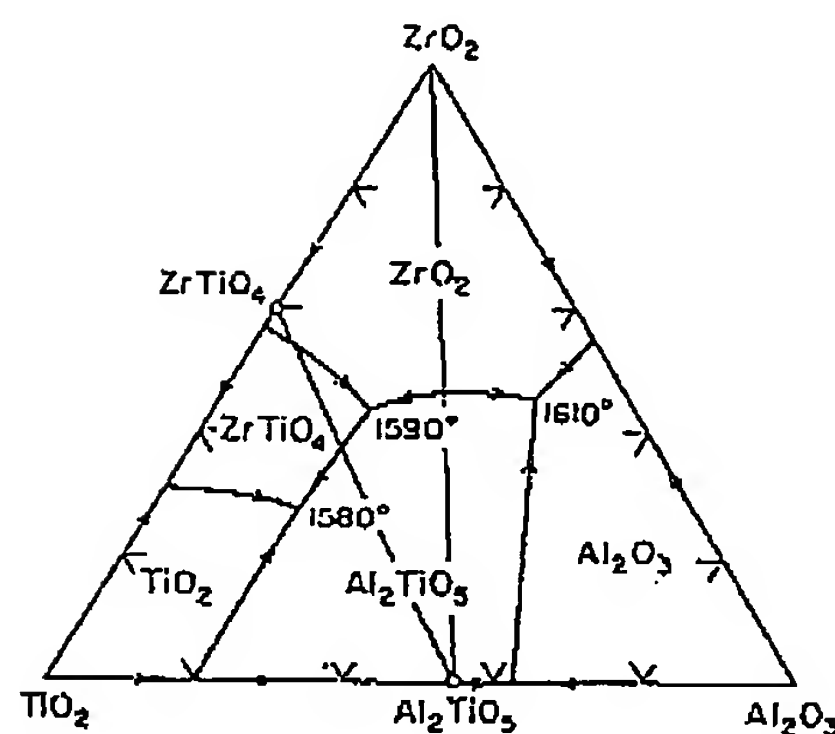


FIG. 774.—System $\text{Al}_2\text{O}_3\text{-TiO}_2\text{-ZrO}_2$; primary phases.

A. S. Berezhnoi and N. V. Gul'ko, *Dopovidi Akad. Nauk Ukr. R.S.R.*, 1955 [1] 78.

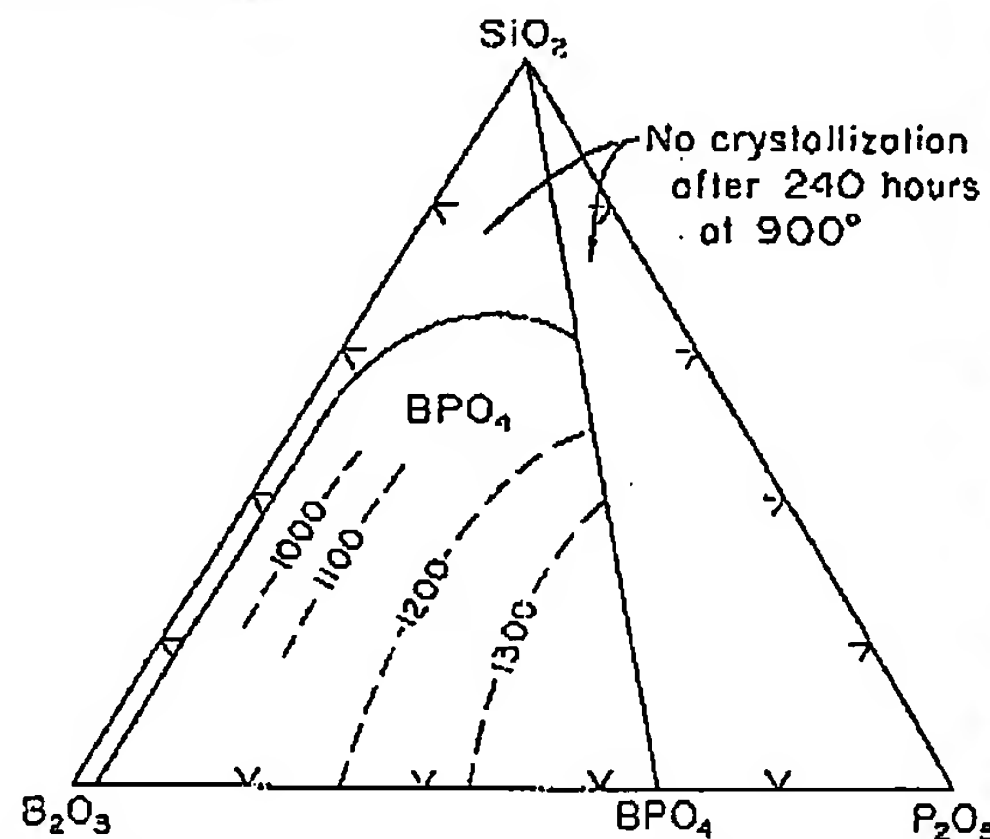
 $\text{B}_2\text{O}_3\text{-SiO}_2\text{-P}_2\text{O}_5$ 

FIG. 775.—System $\text{B}_2\text{O}_3\text{-SiO}_2\text{-P}_2\text{O}_5$. Not true ternary at atmospheric pressure and temperature below 1400°C. because of retained water.

W. J. Englert and P. A. Hummel, *J. Soc. Glass Technol.*, 39, 126T (1955).

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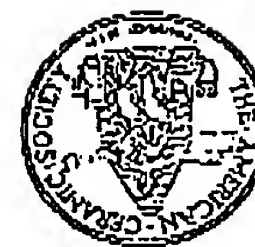
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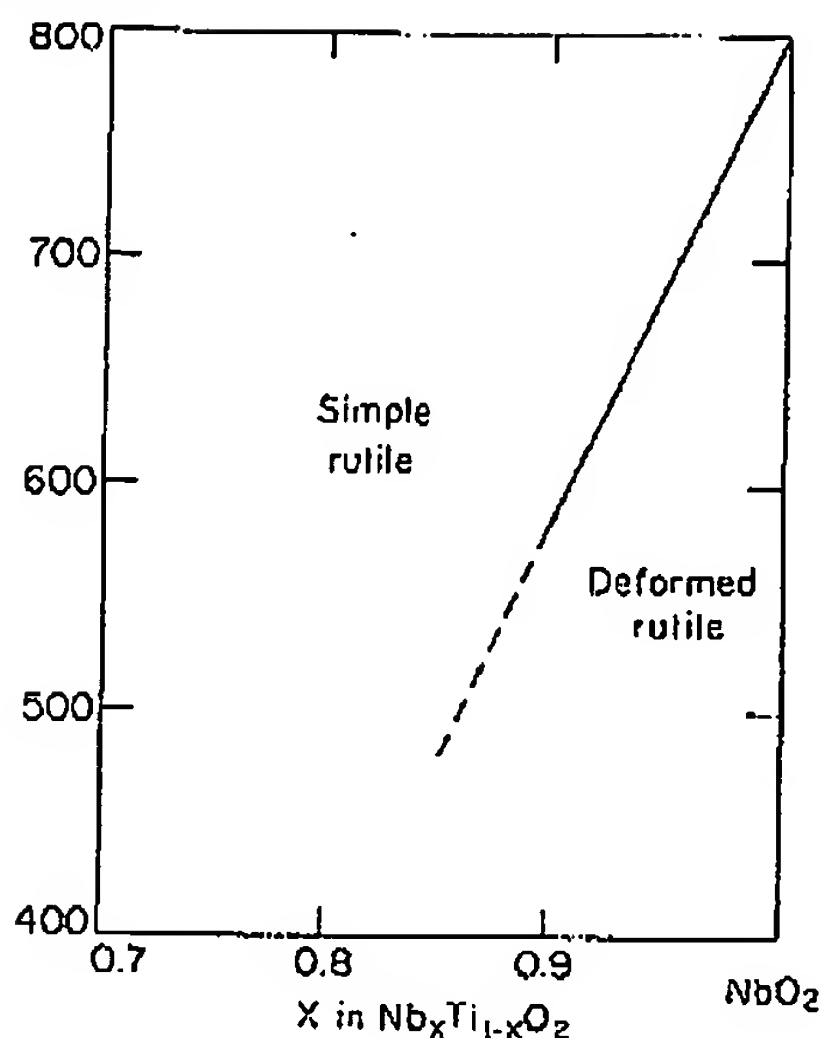
NbO₂-TiO₂

FIG. 4446.—System Nb_xTi_{1-x}O₂, showing phase transition temperature.

K. Sakata, *J. Phys. Soc. Jap.*, 26 [4] 1067 (1969).

Five mixtures of NbO₂ and TiO₂ powders (purity unspecified) were prepared by sealing them under vacuum in a fused-SiO₂ tube and heating them for 1 day at 650° and 2 days at 950°. Phase analysis was conducted by means of X-ray diffraction and TA.

The entire system constitutes a continuous solid-solution series in which the normal rutile phase was identified for 0 < x < 0.85 and the deformed rutile for 0.85 < x at room temperature. In the plot of lattice parameters as a function of composition, c shows a maximum, reflecting a competition between expansion caused by substitution of Nb⁵⁺ for Ti⁴⁺ and contraction resulting from the formation of Nb-Nb pair bonds in the lattice. For x = 0.85, the X-ray diffraction patterns show superstructure reflections which characterize the deformed rutile-type structure, whereas by DTA no thermal effects were observed.

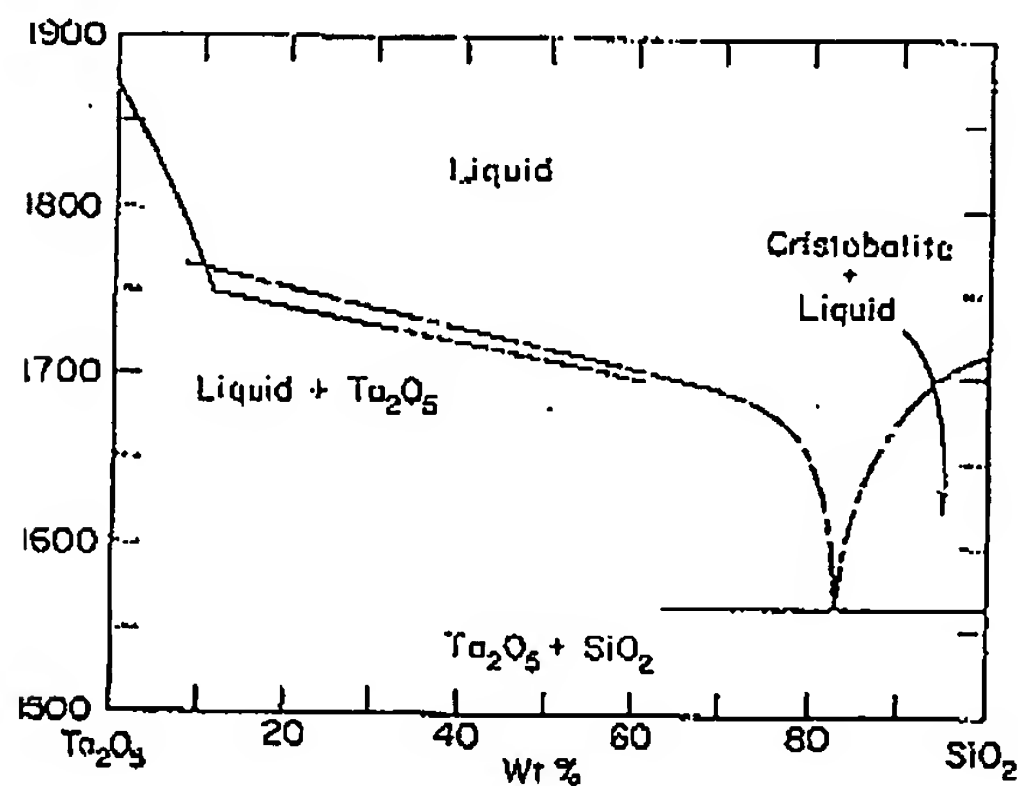
SiO₂-Ta₂O₅

FIG. 4447.—System Ta₂O₅-SiO₂. Dash-dot curve is after E. A. Bush, Progress Reports Nos. 1 and 2, Department of Ceramic

Technology, Pennsylvania State University, University Park, PA, 1984.

D. A. Reeve and N. F. H. Bright, *J. Amer. Ceram. Soc.*, 52 [8] 407 (1969).

The liquidus curve near the Ta₂O₅ component was determined from data for 8 compositions using a Griffin-Telin hot-stage microscope modified for 2 kinds of noble-metal thermocouples, as described in the commentary to Fig. 4316. Starting materials consisted of silicic acid (Analyzed Reagent, J. T. Baker Chemical Co.) and Ta₂O₅ (Fansteel Inc., C-200) with a stated purity of 99.9%. Mixtures were homogenized by pellicization followed by sintering at 1500° for 48 h, with intermediate grinding.

The liquidus curve of Bush (determined by strip-furnace measurements) extrapolated to 100% Ta₂O₅ gives 1785°, which is the reported mp of the low-temperature form.¹ According to Ref. 2 (Fig. 4448), the addition of SiO₂ (as well as WO₃, GeO₂, B₂O₃, and Al₂O₃) to Ta₂O₅ forms phases structurally similar to low Ta₂O₅, which are stable up to solidus temperatures. An alternate explanation for the increased stability of low Ta₂O₅ is solid solution of the added oxides. The sharp discontinuity in the liquidus at ≈1750° is consistent with either hypothesis.

1. A. Reisman, R. Holtzberg, M. Berkenblit, and M. Berry, *J. Amer. Chem. Soc.*, 78 [18] 4514 (1956).
2. R. S. Roth and J. L. Waring, *J. Res. Nat. Bur. Stand., Sect. A*, 74 [4] 485 (1970).

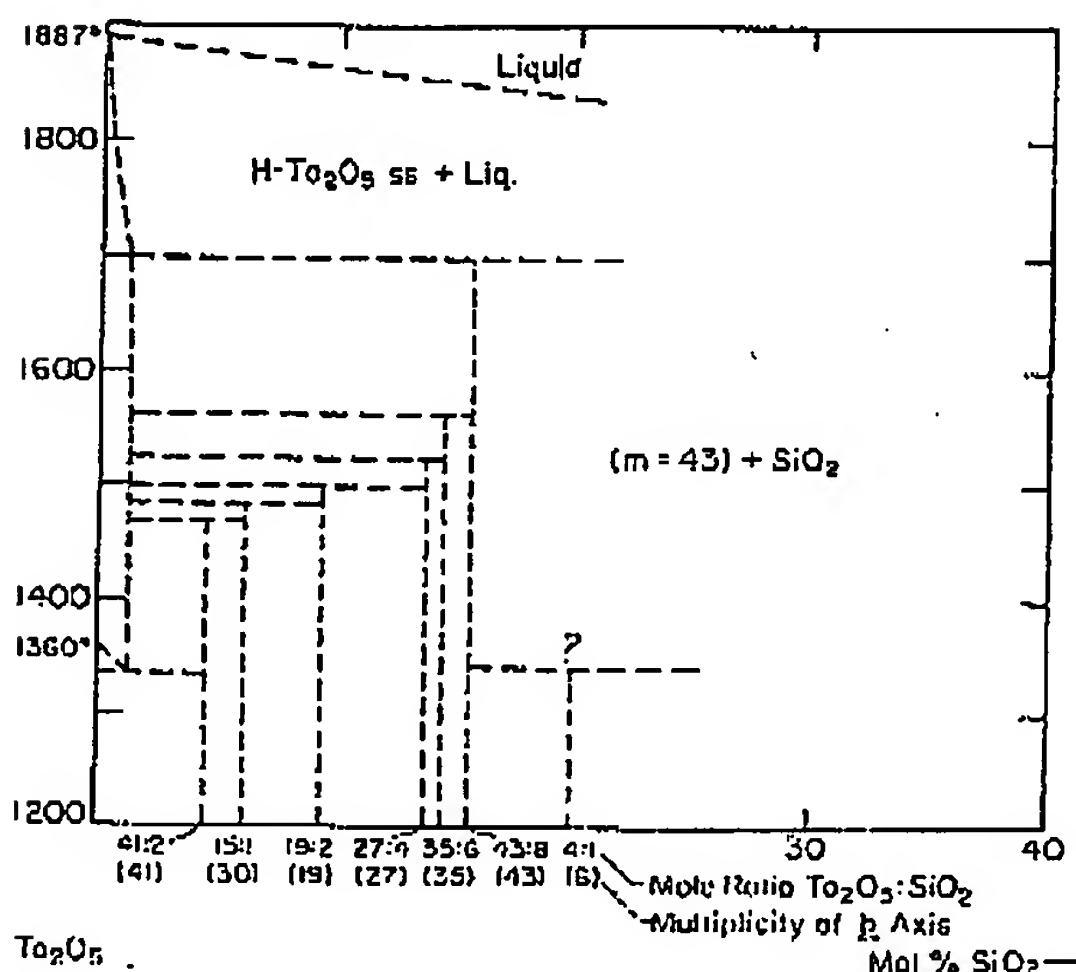


FIG. 4448.—System Ta₂O₅-SiO₂, showing Ta₂O₅-rich region. R. S. Roth and J. L. Waring, *J. Res. Nat. Bur. Stand., Sect. A*, 74 [4] 487 (1970).

Except for the following modifications, the materials, methods, and interpretation are similar to those for the companion Al₂O₃-Ta₂O₅ system (Fig. 4380). Four compositions containing 5, 10, 25, and 50% SiO₂ (reagent grade) were prepared with the Ta₂O₅ by the solid-state method. Final heat treatments were done in sealed Pt tubes at temperatures between 1925° and 1995° for 4.5 to 65 h, before quenching and examination by X-ray diffraction powder techniques. Although not shown on the diagram, it should be noted that the data may also be interpreted on the basis of a conventional solid-solution phase diagram. Figure 4447 shows the liquidus for the entire system.

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